

Four new species of *Contulma* from South America (Trichoptera: Anomalopsychidae)

RALPH W. HOLZENTHAL & DESIREE R. ROBERTSON

Department of Entomology, University of Minnesota, 1980 Folwell Ave., Room 219, St. Paul, Minnesota,
55108, U.S.A. E-mail: holze001@umn.edu; robe0494@umn.edu

Abstract

Four new species in the caddisfly genus *Contulma* Flint 1969 (Trichoptera: Anomalopsychidae) are described from Bolivia and southeastern Brazil: *C. boliviensis* n. sp. (Bolivia), *C. fluminensis* n. sp. (Brazil), *C. meloi* n. sp. (Brazil), and *C. tripui* n. sp. (Brazil). The Bolivian species represents the first record of the genus and family for Bolivia. The Brazilian species form a closely related group of species also including *C. tijuca* Holzenthal & Flint 1995.

Key words: Trichoptera, Anomalopsychidae, *Contulma*, South America, Neotropics, new species, Bolivia, Brazil

Introduction

The caddisfly genus *Contulma* Flint, 1969, a member of the endemic Neotropical family Anomalopsychidae, was last revised by Holzenthal & Flint (1995) when they described 18 new species, reviewed the 3 previously described species, and presented a species phylogeny. Since 1995, no additional new species or new records have been added to the literature. Members of the genus and the family are rare and seldom collected; there is only 1 other genus, the monobasic *Anomalopsyche minuta* (Schmid, 1957). In fact, the 21 described species of *Contulma* are known from only 144 adult specimens; the 4 new species described here are known from only 5 specimens! The rarity of adult specimens is somewhat due to the fact that adults seldom come to blacklights, the standard method for collecting adult caddisflies, but primarily from the fact that these insects frequent small waterfalls, seeps, and small streams in lush, forested, usually remote, montane areas where they have to be netted during the day. They seem to display a high degree of local endemism throughout the mountainous regions of Central and South America. Species are known from Costa Rica (6 species), Colombia (7 species), Ecuador (7 species), Peru (1

species), Chile (1 species), and Brazil (1 species) (2 species occur in both Colombia and Ecuador). No species have been described previously from Bolivia and only 1 has been described from Brazil prior to this paper. The scarcity of specimens and patchiness of their distribution suggests that many additional rare and endemic species remain to be discovered in the highlands of Central and South America.

Material and methods

Methods used for preparation of specimens followed those discussed by Blahnik & Holzenthal (2004) and Holzenthal & Andersen (2004). Genitalia were cleared in 85% lactic acid heated to 125°C for about 30 minutes. Pencil drawings of genitalic structures were made by use of a drawing tube on an Olympus BX41 compound microscope. Final illustrations were rendered in Adobe Illustrator®. Morphological terminology follows Holzenthal & Flint (1995). Each specimen examined during the study was affixed with a barcode label (4 mil polyester, 8 x 14 mm, code 49) bearing a unique alphanumeric sequence beginning with the prefix UMSP. The prefix is not meant to imply ownership by the University of Minnesota Insect Collection (UMSP), but only to indicate that the specimen was databased at that collection. Specimen-level taxonomic and collection data are stored in Biota® (v. 2.0, Sinauer Associates, Inc.) (Colwell 2004) and can be accessed from <http://www.entomology.umn.edu/museum/databases/BIOTAdatabase.html>. Types of the new species are deposited in the collections of the Museo de Historia Natural Noel Kempff Mercado, Santa Cruz de la Sierra, Bolivia (UASC), Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP) and the University of Minnesota Insect Collection, St. Paul, Minnesota, USA (UMSP).

Species descriptions

Contulma Flint, 1969: 513 [type species: *Contulma cranifer* Flint, by original designation].

Contulma boliviensis, new species

Figs. 1A–E

Contulma boliviensis is a member of the Cranifer Group of Holzenthal & Flint (1995) based on the possession of an elongate dorsolateral process posteriorly on segment IX of the male genitalia. It stands isolated within the group as no other species has such a deeply excavated, C-shaped segment IX, but it shares with *C. ecuadorensis* Holzenthal and Flint and *C. cranifer* elongate, semimembranous sub-phallic processes. The phallus of this new species, with its flap-like, downturned, lateral flanges, is also unique.

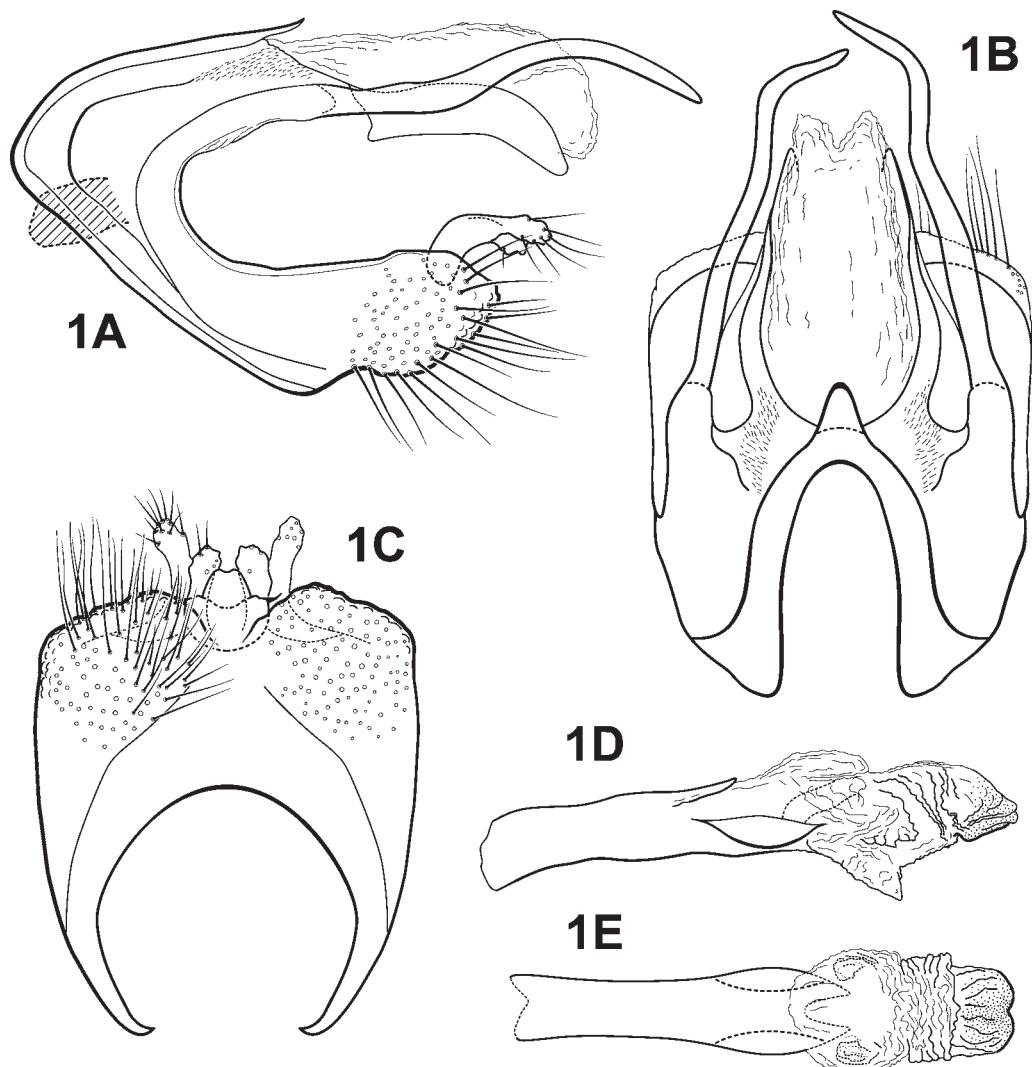


FIGURE 1. *Contulma boliviensis* n. sp. Male genitalia: A—Lateral; B—Dorsal; C—Ventral; D—Phallus, lateral; E—Phallus, dorsal.

Length of forewing: 4.6 mm. Forewing (in alcohol) completely denuded, forewing membrane brown, with 4 light spots in membrane along costal margin, another near nyigma; head, thorax, and appendages brown. Posterior foretibial spur very small, much shorter than anterior spur.

Male genitalia. Segment IX in lateral view narrow, C-shaped, with anterior margin strongly rounded, produced anteriorly; posterior margin highly excavated medially, greatly produced ventrally, to form prominent, rounded, setose lobe; posterodorsally with pair of sclerotized, elongate, sinuate, dorsolateral processes, apices acute, turned medially; dorsally segment IX narrow mesally with short, shelflike extension; sternum IX in ventral

view with small, posteromesal, shelf-like projection. Inferior appendage in lateral view short, digitate, sparsely setose apically. Processes of subphallic membranes present, digitate, setose, longer than inferior appendages and lateral to inferior appendages. Segment X elongate, membranous, with lightly sclerotized lateral flanges. Phallus relatively simple; phallobase sclerotized, tubular, elongate, straight; in dorsal view not broad posteriorly, laterally with flap-like, downturned flanges, subapicoventrally with paired membranous lobes; apex of phallus with membranous and semimembranous lobes as in Figs. 1D, E; phallotremal sclerite not evident.

Female. Unknown.

Holotype male: BOLIVIA: Santa Cruz: Parque Nacional Amboró, 17°50'15"S, 64°23'29"W, 2030 m, flight intercept trap, AMB 21FIT002, 17–20.x.2001, Spector, Ledezma (UMSP000086401) (UASC).

Etymology. Named for the type country, in recognition of the first species in the genus *Contulma* to be described from Bolivia.

Contulma fluminensis, new species

Figs. 2A–F

Among the Brazilian species, *C. fluminensis* is closest to *C. tripui* n. sp. in sharing a highly complex phallic apparatus with very large, highly convoluted membranous lobes and apical spatulate sclerites, but differs from *C. tripui* n. sp. in having smaller, much more ventrally situated posterior lobes of segment IX.

Length of forewing: 4.7 mm. Forewing color very dark brown, almost black, immaculate; head, thorax, and appendages brown. Posterior foretibial spur about 1/2 length of anterior spur.

Male genitalia. Segment IX in lateral view narrow, with anterodorsal margin produced anteriorly, heavily setose ventrally; posterior margin straight dorsally and medially, very abruptly produced ventrolaterally to form narrow, prominent, heavily setose lobe; posterodorsally with pair of lightly sclerotized, elongate, curved, ventrally directed, dorsomesal processes with rugose apices; dorsally segment IX highly reduced; sternum IX in ventral view with posteromesal, sclerotized, spatulate projection, surface longitudinally striate, apically cleft, anteromesally bearing about 4 flat, fused, toothlike setae. Inferior appendage in lateral view short, subtriangular, dorsal margin straight, bearing about 4 or 5 short setae, ventral margin heel-like; inferior appendages apparently fused to base of sternum IX projection, together forming highly complex structure as in Figs. 2A, C. Processes of subphallic membranes absent (or not visible). Segment X highly reduced, entirely membranous. Phallus complex; phallobase sclerotized, tubular, curved; in dorsal view broad posteriorly, apicoventrally with heavily sclerotized, apically cleft lobe; apex of phallus with complex membranous lobes and sclerites as in Figs. 2D–F; dorsally with paired, very large, highly convoluted, membranes; apicolaterally with paired, highly

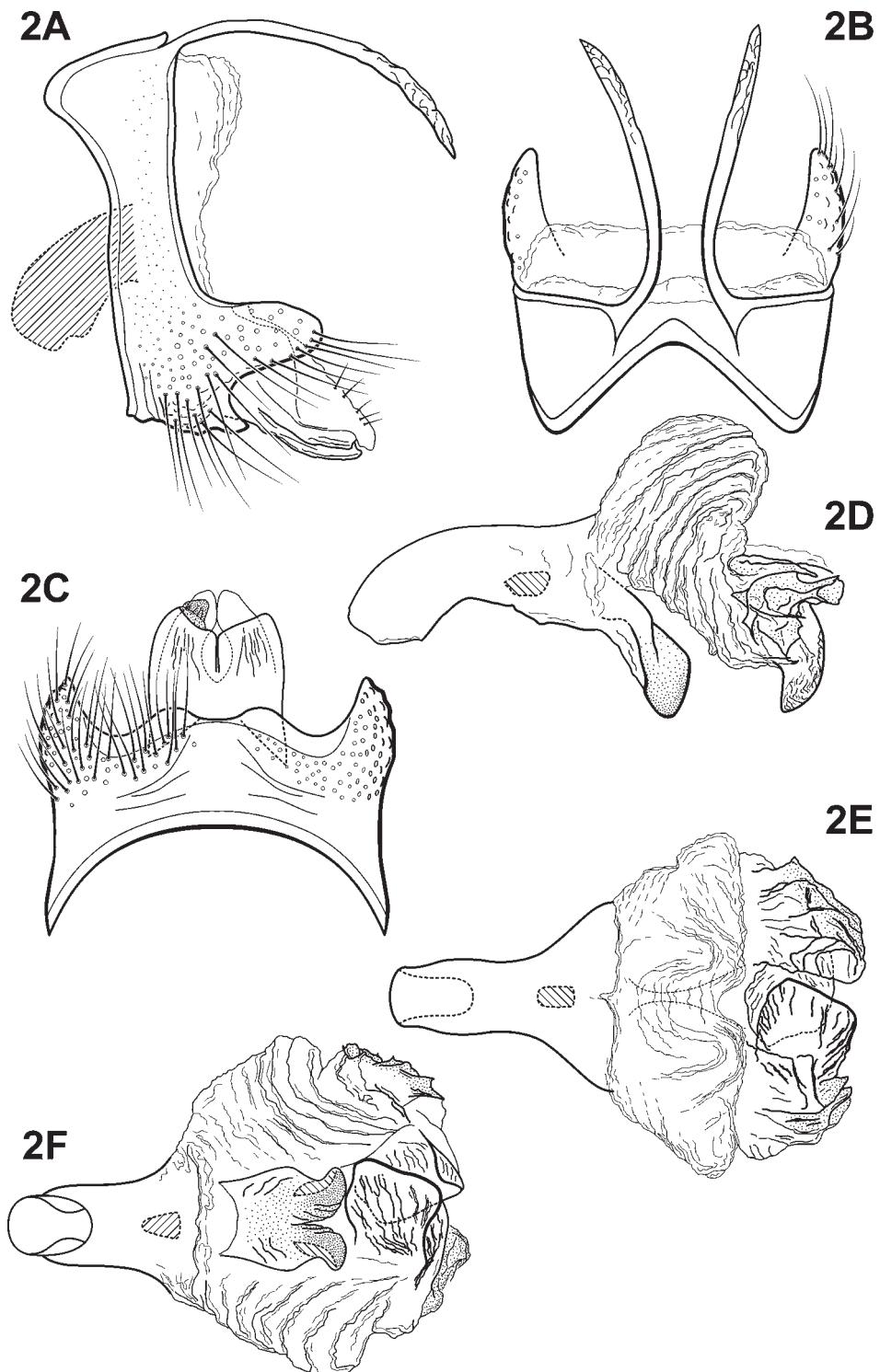


FIGURE 2. *Contulma fluminensis* n. sp. Male genitalia: A—Lateral; B—Dorsal; C—Ventral; D—Phallus, lateral; E—Phallus, dorsal; F—Phallus, ventral.

convoluted, membranous lobes, partially with highly irregular, scalloped, semisclerotized surface, apically with large, broad, spatulate sclerites, bearing prominent keel-like striae on their outer surfaces; phallotremal sclerite present, small, subspherical.

Female. Unknown.

Holotype male: BRAZIL: Rio de Janeiro: Rio Macaé, Macaé da Cima, 22°23'41"S, 42°30'08"W, el. 1000 m, 8.iii.2002, Holzenthal, Blahnik, Paprocki, Prather (UMSP000086069) (MZUSP).

Etymology. From the Latin word *flumen* for stream or river and a traditional Latinization used in Brazil for something from the state of Rio de Janeiro, Brazil.

Comments. Holzenthal & Flint (1995, fig. 109) interpreted the digitate, apically setose processes above the posteromesal projection of sternum IX in *C. tijuca* to be processes of the subphallic membranes. Upon examination of these structures in *C. fluminensis* and the 2 other closely related Brazilian species described below, we reinterpret these structures to be homologous to inferior appendages based on their position in relation to sternum IX. The processes of the subphallic membranes appear to be absent in the Brazilian species or are not delineated as distinct processes or lobes within the membranes.

Contulma meloi, new species

Figs. 3A–G

This new species is related to *C. tijuca* and the other Brazilian species described here, but differs from the other species in the dorsomesal processes of segment IX, which are absent or very short in *C. meloi*.

Length of forewing: 3.8 mm (both specimens). Forewing color (in alcohol) light brown, immaculate; head, thorax, and appendages light brown. Posterior foretibial spur about 1/2 length of anterior spur.

Male genitalia. Segment IX in lateral view broad, with anterior margin relatively straight, heavily setose ventrally; posterior margin straight dorsally and medially, produced ventrolaterally to form broad, prominent, heavily setose lobe; posterodorsally without processes in holotype (Figs. 3A, B), but with very short, acute processes in paratype (Fig. 3G); dorsally segment IX highly reduced; sternum IX in ventral view with posteromesal, sclerotized, spatulate projection, surface longitudinally striate, apically cleft, anteromesally bearing about 4 flat, fused, toothlike setae. Inferior appendage in lateral view short, subtriangular, dorsal margin straight, bearing about 4 or 5 short setae, ventral margin heel-like; inferior appendages apparently fused to base of sternum IX projection, together forming highly complex structure as in Figs. 3A, C. Processes of subphallic membranes absent (or not visible). Segment X highly reduced, entirely membranous. Phallus relatively simple; phallobase sclerotized, tubular, curved; in dorsal view broad posteriorly; apex of phallus with membranous and semimembranous lobes as in Figs. 3D–F; apicodorsally with paired membranes, apex semimembranous;

apicoventrally with paired semimembranous lobes; phallotremal sclerite present, large, subspherical.

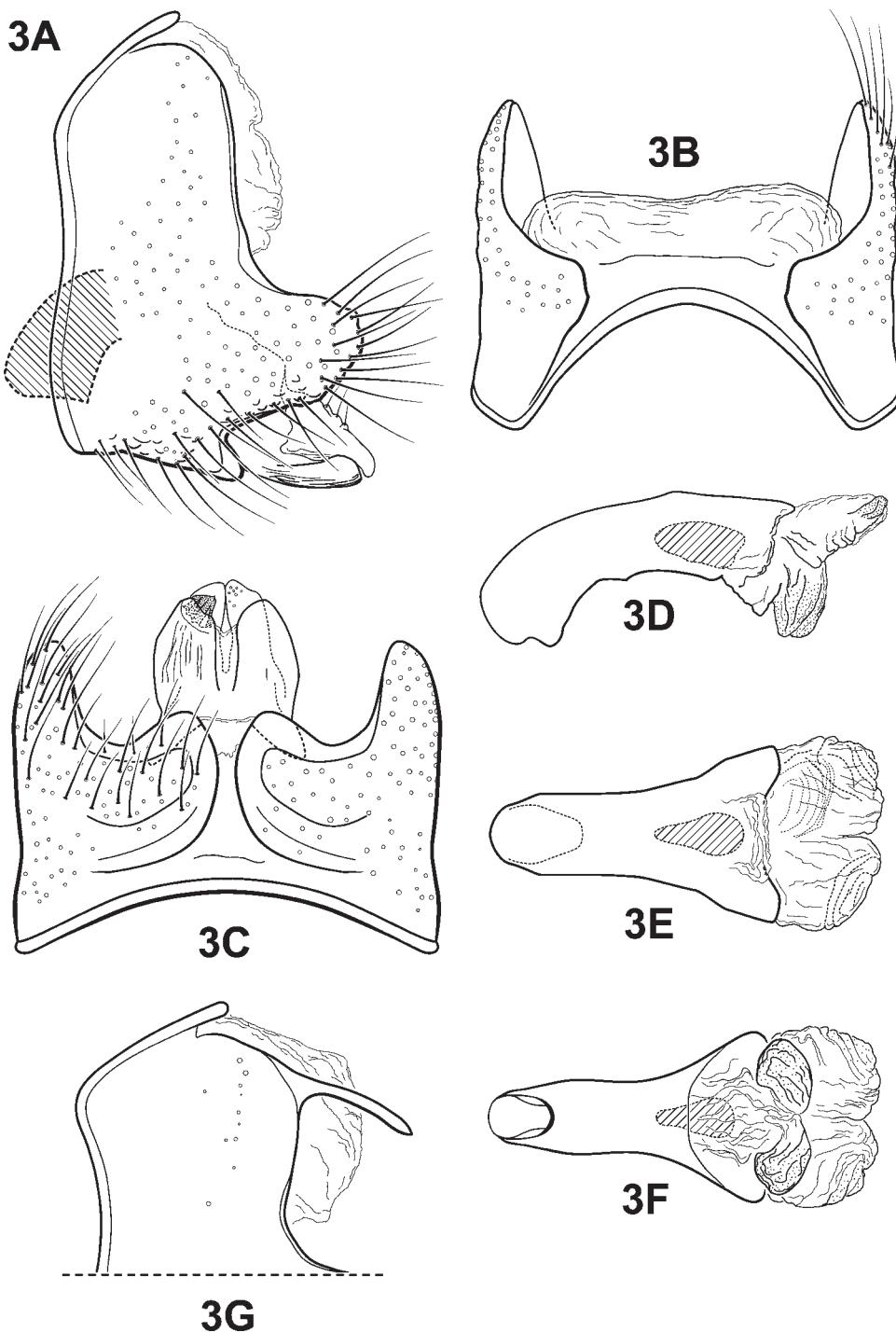


FIGURE 3. *Contulma meloi* n. sp. Male genitalia: A—Lateral; B—Dorsal; C—Ventral; D—Phallus, lateral; E—Phallus, dorsal; F—Phallus, ventral; G—Segment IX, lateral (male paratype).

Female. Unknown.

Holotype male: BRAZIL: São Paulo: Estação Biológica de Boracéia, Rio Venerando, 23°39'11"S, 45°53'25"W, el. 850 m, 18–21.ix.2002, Blahnik, Prather, Melo, Froehlich, Silva (UMSP000210914) (MZUSP).

Paratype: BRAZIL: São Paulo: same data as holotype — 1 male (UMSP).

Etymology. The new species is named in honor of Dr. Adriano Sanches Melo in recognition of his friendship and assistance to the senior author and his colleagues during their work and travels in Brazil. Dr. Melo's research interests lie in the ecology and natural history of aquatic insects in Brazil, especially the Trichoptera. He also helped collect the new species.

Contulma tripui, new species

Figs. 4A–E

Contulma tripui is most similar to *C. fluminensis* based on the similarly complex morphology of the phallic apparatus, but it differs primarily in having the anterodorsal margin of segment IX prominently produced anteriorly and the lobe of the posterolateral margin of IX situated much more nearly medially than in *C. fluminensis*.

Length of forewing: 4.5 mm. Forewing color dark brown, immaculate; head, thorax, and appendages brown. Posterior foretibial spur about 1/2 length of anterior spur.

Male genitalia. Segment IX in lateral view broad, with anterodorsal margin prominently produced anteriorly, heavily setose ventrally; posterolateral margin produced medially to form broad, prominent, subtriangular, heavily setose lobe; posterodorsally with pair of lightly sclerotized, elongate, curved, ventrally directed, dorsomesal processes with rugose apices; dorsally segment IX highly reduced; sternum IX in ventral view with posteromesal, sclerotized, spatulate projection, surface longitudinally striate, apically cleft, anteromesally bearing about 4 flat, fused, toothlike setae. Inferior appendage in lateral view short, subtriangular, dorsal margin straight, bearing about 4 or 5 short setae, ventral margin heel-like; inferior appendages apparently fused to base of sternum IX projection, together forming highly complex structure as in Figs. 4A, C, and inset. Processes of subphallic membranes absent (or not visible). Segment X highly reduced, entirely membranous. Phallus complex; phallobase sclerotized, tubular, curved; in dorsal view broad posteriorly, ventromedially with posterior membranous lobe, apicoventrally with lightly sclerotized lobe; apex of phallus with complex membranous lobes and sclerites as in Figs. 4D, E; dorsally with paired, very large, highly convoluted, membranous; apicolaterally with paired, highly convoluted, membranous lobes, apically with large, broad, spatulate sclerites, bearing prominent keel-like longitudinal striae on their outer surfaces; phallotremal sclerite present, small, subspherical.

Female. Unknown.

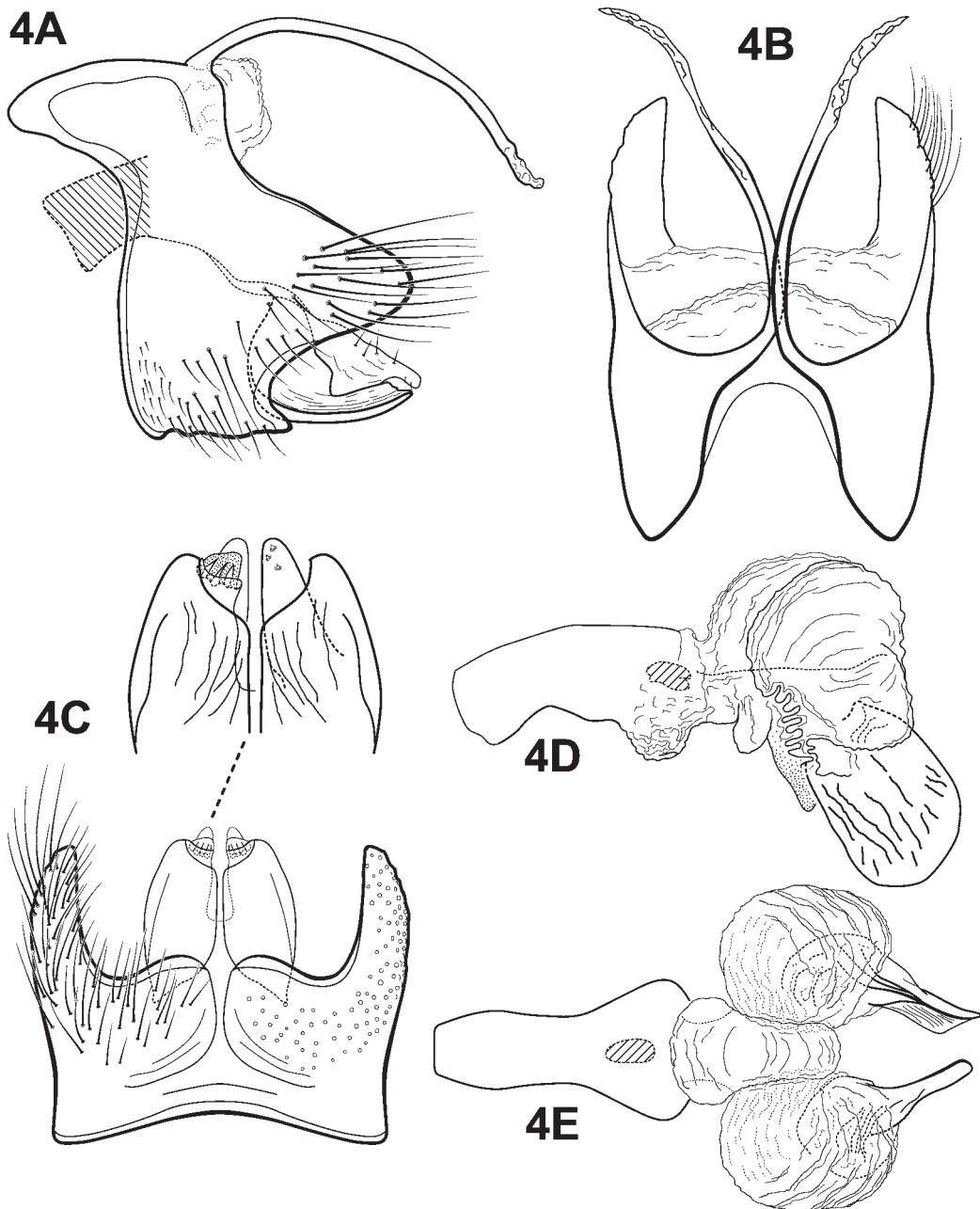


FIGURE 4. *Contulma tripui* n. sp. Male genitalia: A—Lateral; B—Dorsal; C—Ventral (inset, detail of sternum IX projection); D—Phallus, lateral; E—Phallus, dorsal.

Holotype male: BRAZIL: Minas Gerais: Estação Ecológica do Tripuí, Córrego Tripuí, 20°23'22"S, 43°32'32"W, el. 1070 m, 20.ix.1998, Paprocki, Braga (UMSP000046938) (MZUSP).

Etymology. Named for the small stream in the ecological station of the same name,

known for harboring an endemic species of onychophoran, *Peripatus acacioi*. *Tripuí* is the indigenous Tupi word for fast or quick water.

Additional material examined

In addition to the material listed above for the new species, we have examined specimens of 2 undetermined females that may represent additional, undescribed species. Because specimens in this genus are so rare, we list this material below to alert researchers and collectors to the occurrence of the genus in these additional localities and to encourage further exploration in the region.

BRAZIL: Rio de Janeiro: Rio Macacú (2nd order), on RJ116, km 62, 22°23'12"S, 042°33'57"W, el. 840 m, 17.iii.1996, Holzenthal, Rochetti, Oliveira — 1 female (UMSP);
São Paulo: Parque Nacional da Serra da Bocaina, small trib, main park road, 22°46'35"S, 044°36'18"W, el. 1560 m, 2–3.iii.2002, Holzenthal, Blahnik, Paprocki, & Prather — 1 female (UMSP).

Discussion

Based on the phylogeny proposed by Holzenthal & Flint (1995), *C. fluminensis*, *C. meloi*, *C. tripui*, *C. cranifer*, and *C. tijuca* form a monophyletic group of species within the Cranifer Group sharing the almost complete loss of segment X in the male genitalia. In these species segment X is reduced to a very small membranous region. Except for *C. cranifer* from Chile, all the species in the group occur in southeastern Brazil. Together, the Brazilian species are further differentiated by the uniquely developed projection posteromesally on sternum IX. This projection is spatulate in lateral view and cleft mesally when viewed ventrally, its surface is longitudinally striate and bears apically about 4 flat, fused, tooth-like setae. Closely associated with the sternum IX projection are the inferior appendages that are also uniquely formed within this group of species. Rather than being short, crescentic and curved downward as in *C. bacula* (Holzenthal & Flint 1995, fig. 30), in the Brazilian species they are short, but each is subtriangular with the dorsal margin straight and sparsely setose and the ventral margin heel-like. The inferior appendage-sternum IX complex of the Brazilian species bears some similarity with that found in *C. adamsae* Holzenthal & Flint, perhaps indicating a relationship (Holzenthal & Flint, 1995). All Brazilian species, except *C. meloi*, have characteristic paired, lightly sclerotized dorsomesal processes on tergum IX; however, in the paratype of *C. meloi* very short dorsomesal processes are present. In the other species these processes are elongate, curved, directed ventrad, and have lightly sclerotized, rugose apices.

Acknowledgments

We are grateful to Dr. Sacha Spector, American Museum of Natural History, New York, for the specimen of *C. boliviensis* collected during his research project in Bolivia. Additional assistance, both in the field and in the museum, was received from Roger Blahnik, Virginia Braga, Claudio Froehlich, Henrique Paprocki, Aysha Prather, and Adriano Sanches Melo; this assistance is gratefully acknowledged. This material is based upon work supported by the National Science Foundation grant nos. DEB 9971885 & 0117772.

References

- Blahnik, R.J., & Holzenthal, R.W. (2004) Collection and curation of Trichoptera, with an emphasis on pinned material. *Nectopsyche, Neotropical Trichopera Newsletter*, 1, 8–20. Available from <http://www.entomology.umn.edu/musuem/links/news.html> (accessed 14 July 2006).
- Colwell, R.K. (2004) *Biota 2, The Biodiversity Database Manager*. Sinauer Associates, Inc, Sunderland, Massachusetts, CD-ROM.
- Flint, O.S., Jr. (1969) Studies of Neotropical caddis flies, IX: new genera and species from the Chilean subregion (Trichoptera). *Proceedings of the Entomological Society of Washington*, 71, 497–514.
- Holzenthal, R.W., & Andersen, T. (2004) The genus *Triaenodes* in the Neotropics (Trichoptera: Leptoceridae). *Zootaxa*, 511, 1–80.
- Holzenthal, R.W. & Flint, O.S., Jr. (1995) Studies of Neotropical caddisflies, LI: systematics of the Neotropical caddisfly genus *Contulma* (Trichoptera: Anomalopsychidae). *Smithsonian Contributions to Zoology*, 575, 1–59.
- Schmid, F. (1957) Contribution à l'étude des Trichoptères néotropicaux II (Trichoptera). *Beiträge zur Entomologie*, 7, 379–398.